ABSTRACT:

Silicon (Si) nanocrystals embedded in Si oxide matrix have been formed by rapid thermal annealing of sub-stoichiometric Si oxide films (SiOx with x < 2). The SiOx films were deposited by co-sputtering of Si oxide and Si target using magnetron RF sputtering technique. The Si-to-SiO2 ratio was controlled by varying the number of Si chips being placed on the pure SiO2 target during sputtering. Rapid thermal anneal in nitrogen gas at 1100°C lead to the decomposition of SiOx into Si nanocrystals and SiO2. The structural (size of nanocrystals) and optical properties (absorption and luminescence) of Si nanocrystals embedded in oxide matrix, were found, strongly depend on the initial excess Si concentration in SiOx films.